Tevatron Instrumentation Priorities

- Monitor and control orbits and lattice
- Monitor emittances
- Monitor and control tunes, coupling and chromaticities
- Monitor and control beam oscillations
- Monitor beam currents and losses

Current Tevatron BPM Status

- Filters and triggers in current system are optimized for 6x6 operation.
- Data acquisition is not reliable enough.
- We have improved signal quality and directivity by removing some filters.

BPM Upgrade Priorities

- Give reliable/repeatable orbit measurements for all stages of Tevatron operation.
- Improve resolution.
- Improve data acquisition.

BPM Upgrade Status

- Physics specification 1st draft document complete.
- Physics specification review complete.
- Project leader has been identified.
- Organization of inter-division collaboration in progress.

Emittance Monitors

- Flying Wires
- Synchrotron light monitor
- Sampled bunch display (SBD)
- GHz Schottky pickups
- Ion profile monitors (IPM)

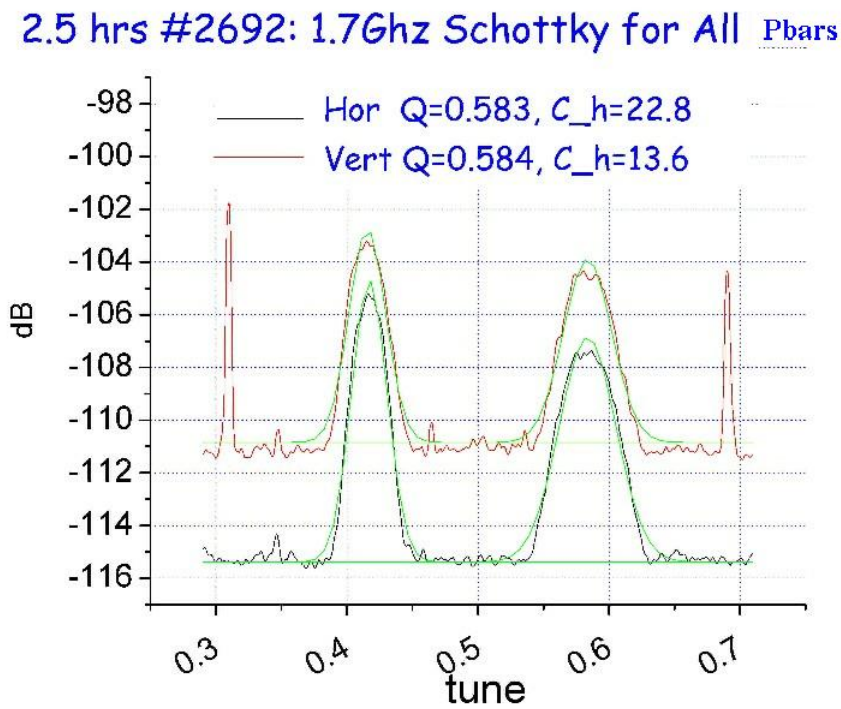
Emittance Calibration

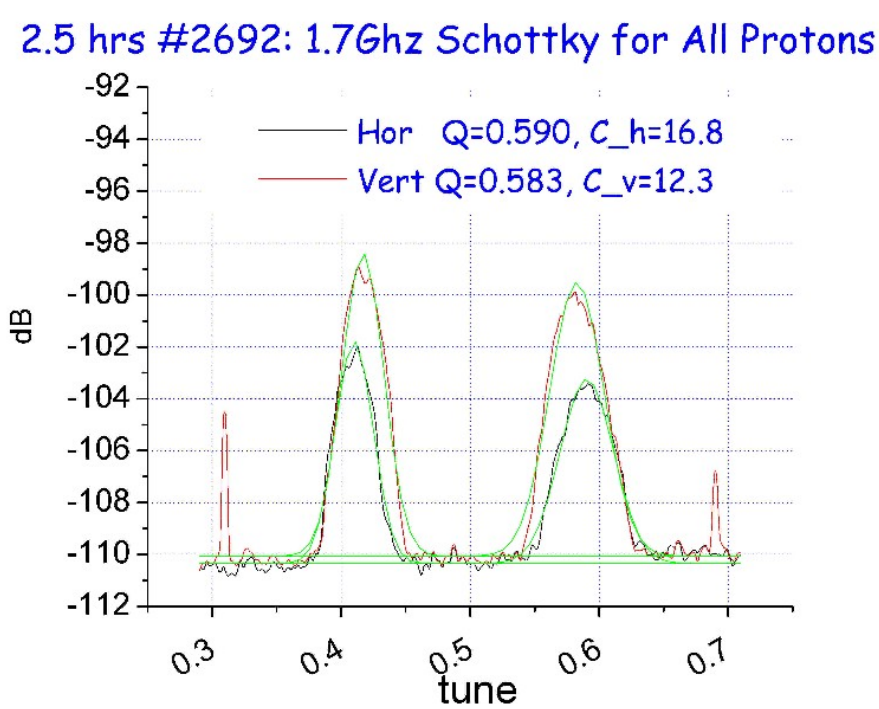
- Ongoing work to collaborate data from flying wires, sync-lite, and collimators.
- Better algorithms for determining transverse emittance in dispersive areas using SBD data.
- Improved algorithms for SBD processing.

GHz Schottky Pickups

- Can see proton and pbar transverse Schottky signals above the noise floor.
- Four hardware channels have been constructed and commissioned (vertical/horizontal, proton/pbar).
- Need to verify feasibility of dedicated emittance monitor. (Ralph Pasquinelli)
- Need to create application software to control instruments and analyze data. (Andreas Jansson)

GHz Schottky Pickups





IPM Challenges and Status

- Small beam size
  - High resolution required
  - Strong space charge effects (B-field required to guide electrons)
- Time response
  - Turn by turn at injection
  - Separate protons from pbars (< 200 ns apart)?

- Currently…
  - Trying to understand performance of existing IPMs (MI, RR, …)
  - Magnet design(s) exist
  - Need to test, understand, and optimize image intensifiers (MCP) and readout electronics.

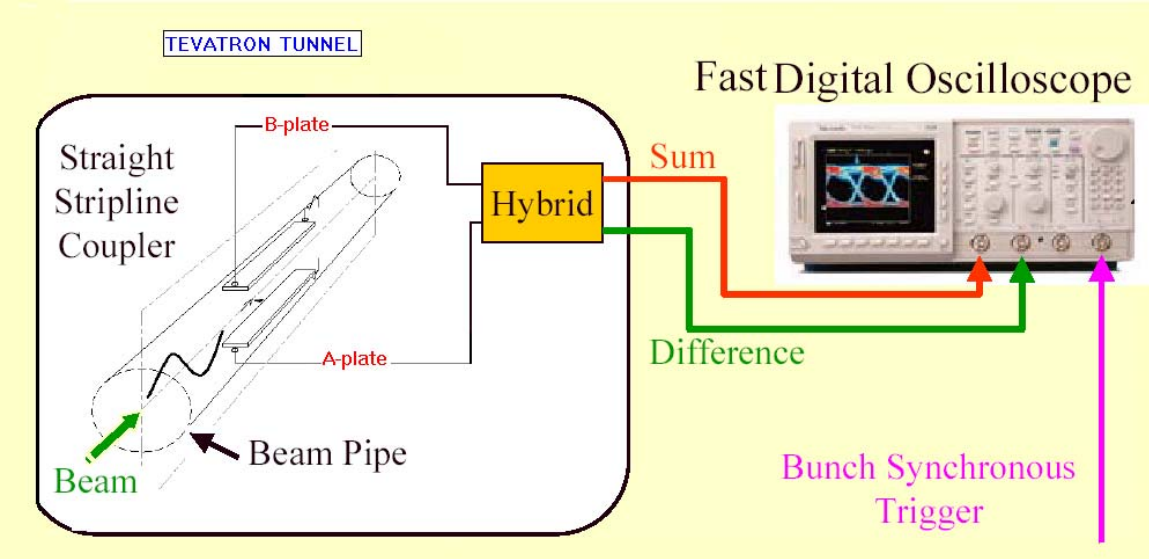
Tunes

- Primary source for tune information is 21MHz Schottky pickups.
- Use transverse damper system as “tickler”, possible for individual bunches.
- Data analysis has been improved for continuous, automated tune monitoring.
- GHz Schottkys offer coarse verification.
- Effort continues into tune tracking system (CY Tan).

Chromaticity

- Currently only done during uncoalesced tuneup. Tune of the beam is measured at different energy settings.
- Studies into data processing of Schottky pickup (Andreas Jansson).
- Head-tail monitoring (Vahid Ranjabar).

Tevatron Single Bunch Head-Tail Dynamics



Tevatron Dampers

- Bunch by bunch longitudinal dampers for protons in operation (not on ramp).
- Bunch by bunch transverse instability dampers for protons in operation (at 150 GeV).
- Bunch by bunch transverse injection dampers for both species to be commissioned this summer.

Longitudinal Diagnostics

- DCCT – IBEAM
- Fast bunch integrator (FBI) wide gate & narrow gate
- SBD
- Mountain Range
- Synchrotron light monitor (for DC beam in abort gap measurement) (Harry Cheung)